Introduction to Microgrids

presentation at the

Ernest Orlando Lawrence Berkeley National Laboratory

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by

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Ernest Orlando Lawrence Berkeley National Laboratory

- U.S. Department of Energy research laboratory
- managed by the University of California, increasingly funded by the State of California

- ~4000 employees
- 10 11 Nobel Laureates
- no classified research
  visiting researchers from around the world always welcome

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Outline

1. What is a microgrid?
2. Two Competing Visions of Our Future Power System
3. Homogeneous & Heterogeneous Security, Quality, Reliability, & Availability (SQRA)
4. Introduction to the CERTS Microgrid

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What is a Microgrid?

A **controlled** grouping of energy (including electricity) sources and sinks that is connected to the *macrogrid* but can function independently of it.

Two Main Benefits to Developers of Microgrids:
- **pushing efficiency limits by heat recovery (CHP)**
- **providing heterogeneous security, quality, reliability, and availability (SQRA)**

There are other potential benefits:
- **reducing market failures in energy use**
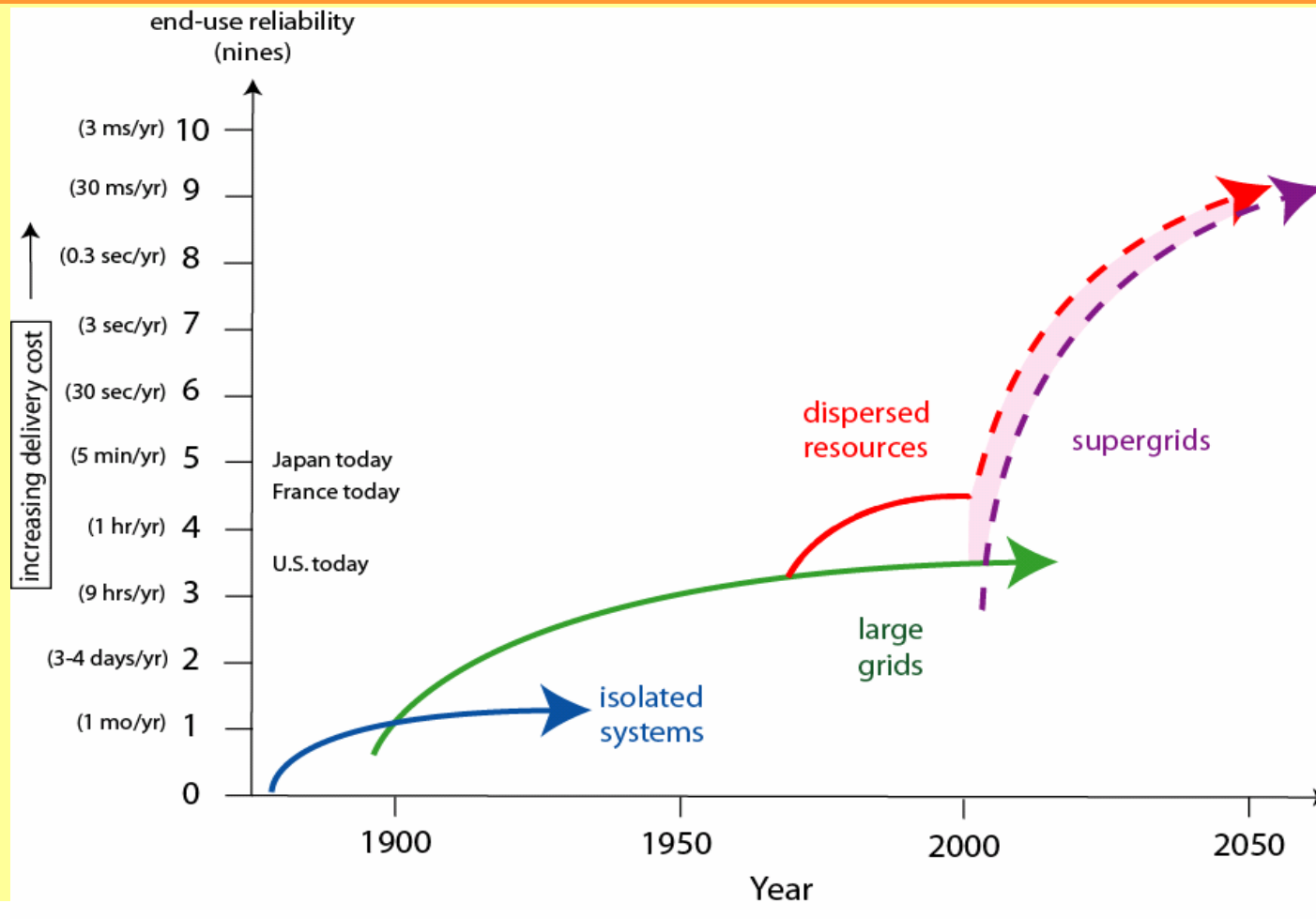- **offering a home to small-scale renewables**

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2. Two Competing Visions of Our Future Power System

Super Grid Vision
(a near perfect all around grid)

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Dispersed Vision
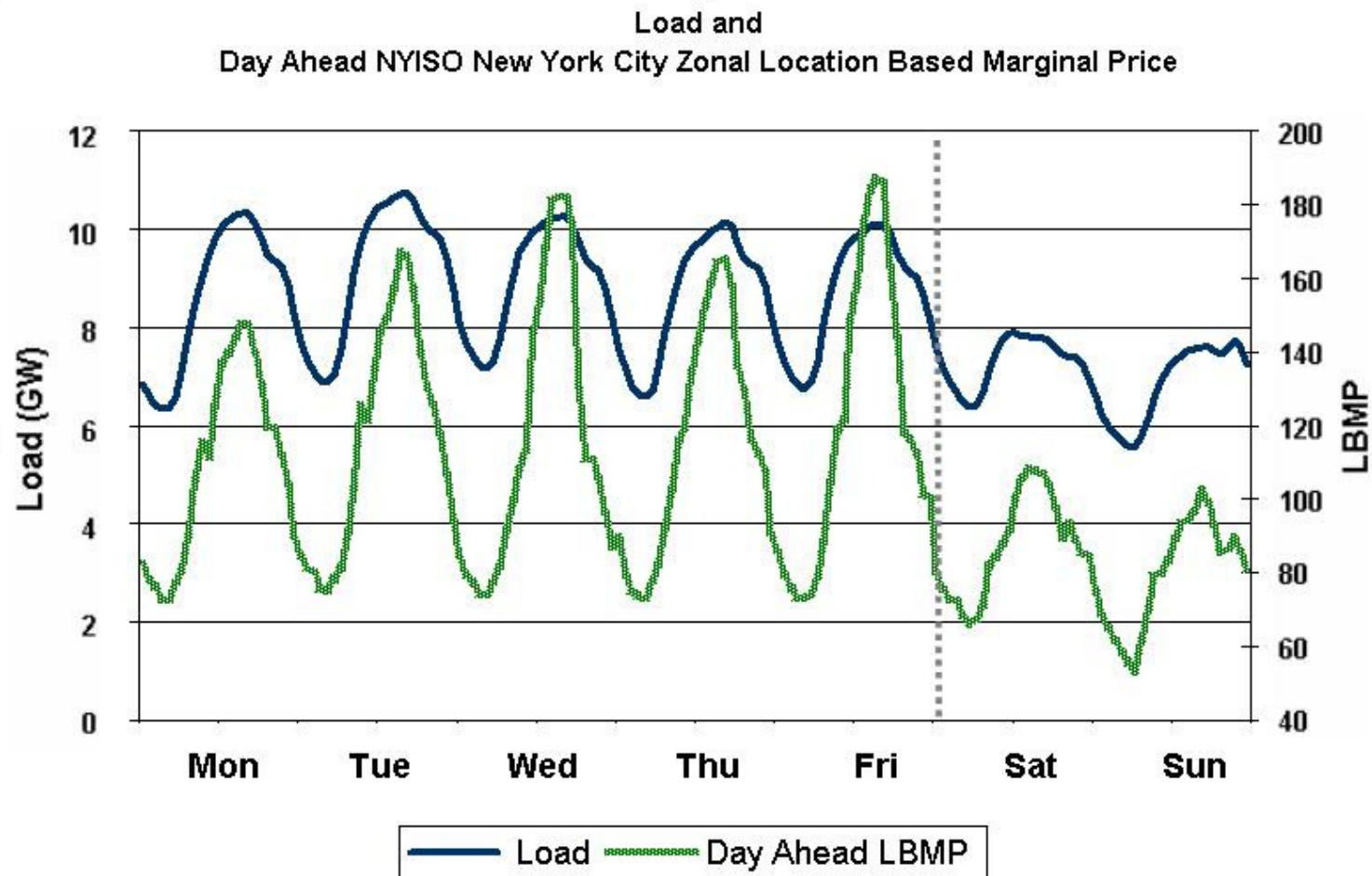## (distributed control & heterogeneous service)
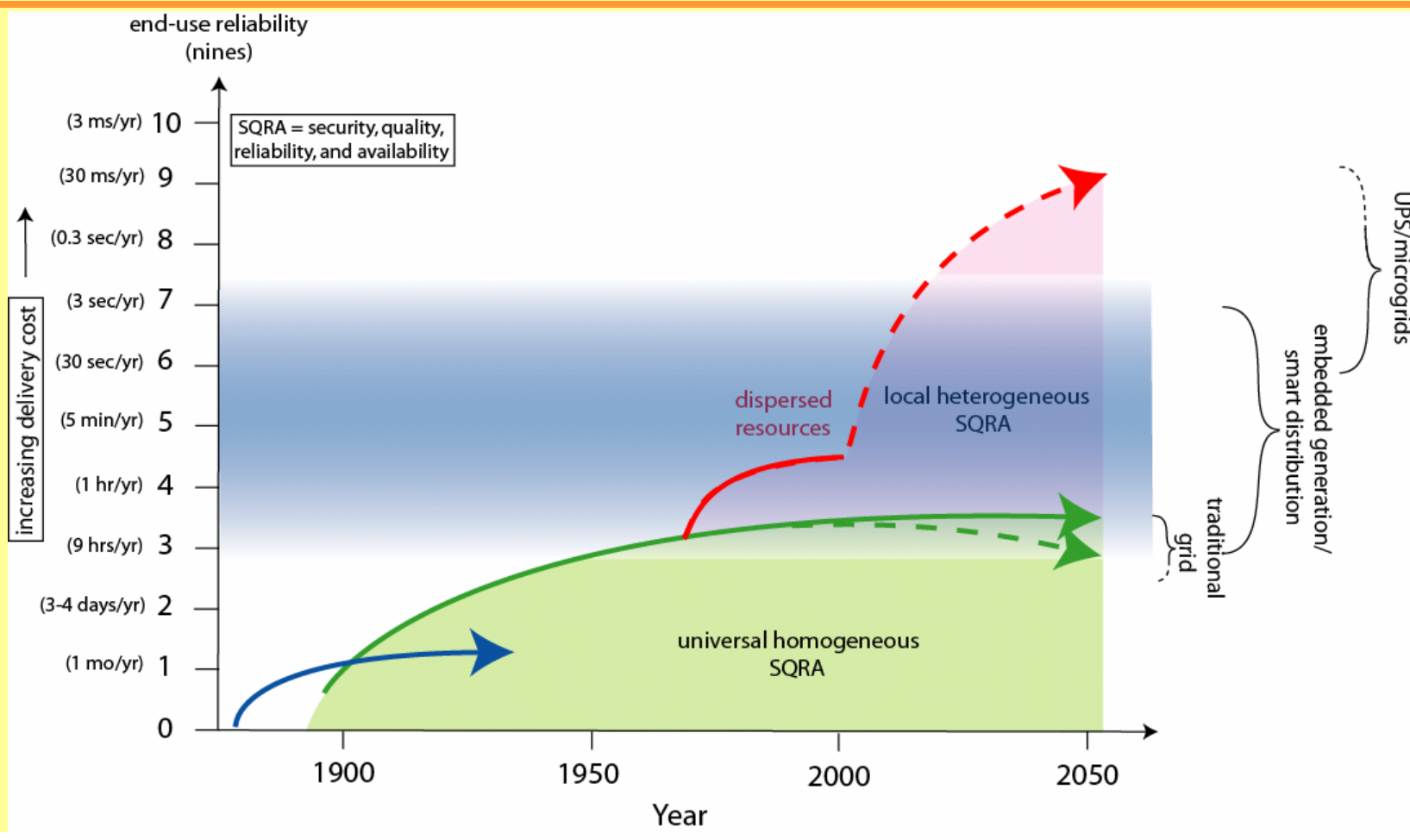
3. Homogeneous & Heterogeneous Security, Quality, Reliability, & Availability (SQRA)

Choosing Universal Service Quality

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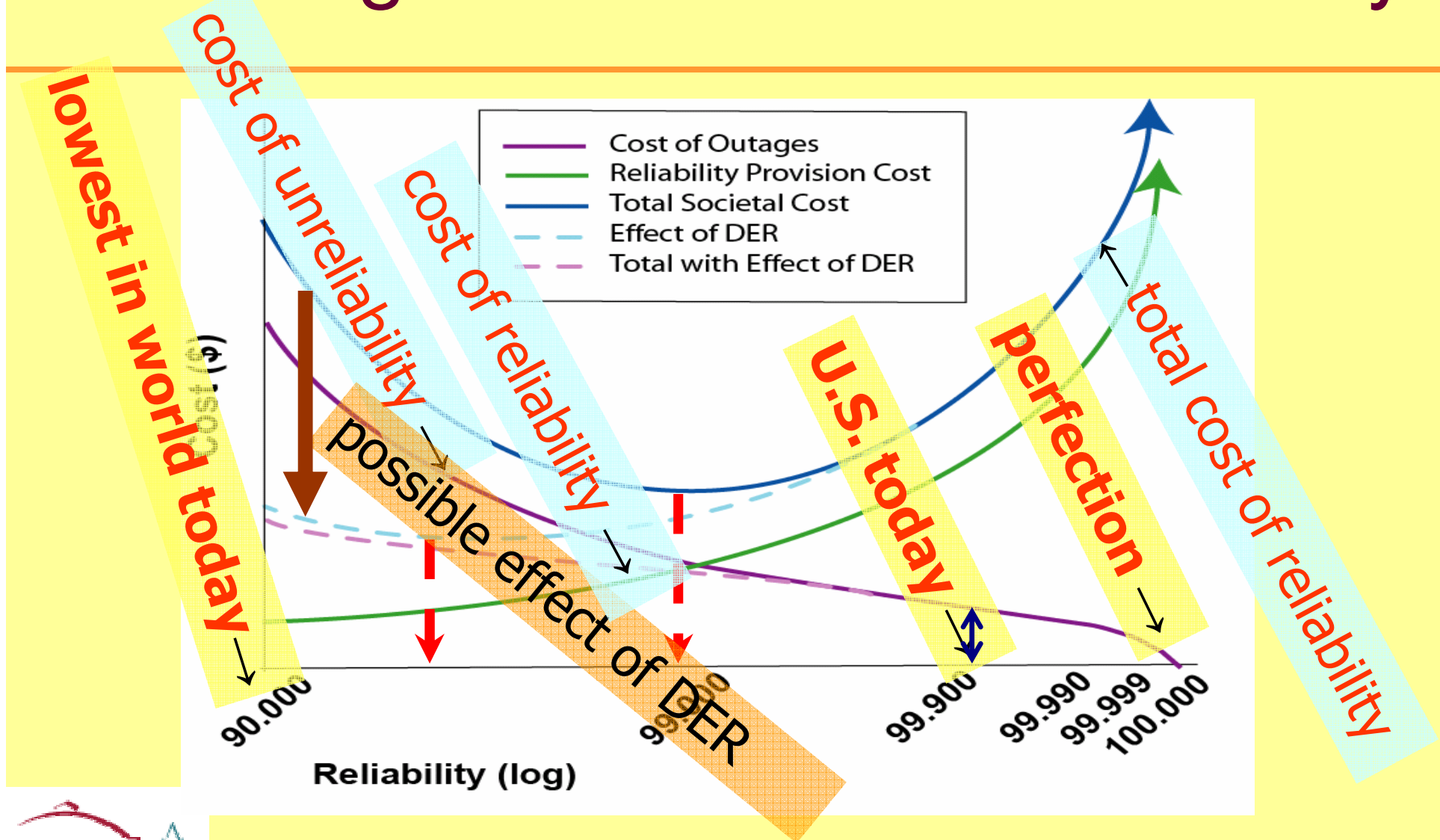
Value Varies in Time (and Space)

Load and
Day Ahead NYISO New York City Zonal Location Based Marginal Price

Legend: Load — Day Ahead LBMP

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Matching SQRA to Requirements
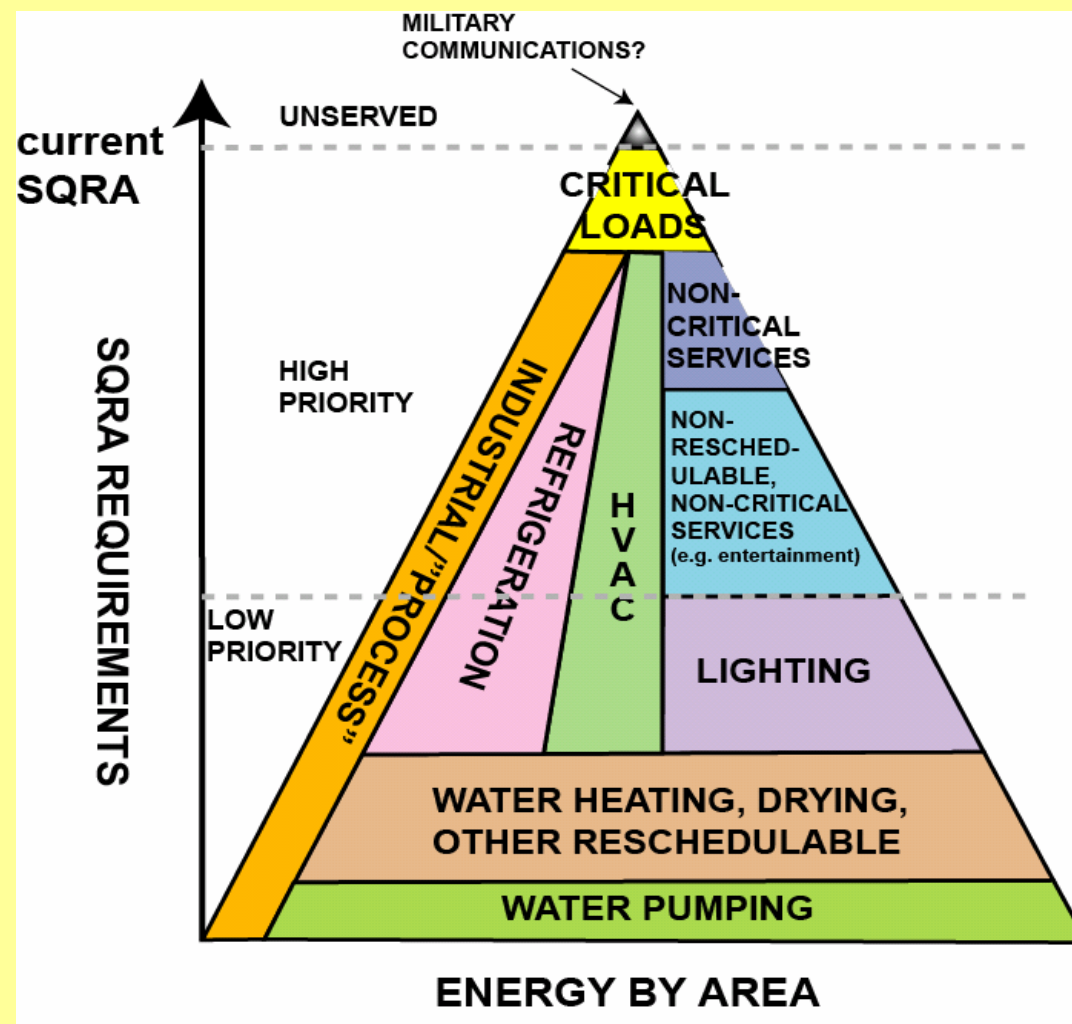
4. Introduction to the CERTS Microgrid

Consortium for Electric Reliability Technology Solutions (CERTS)

Washington State University
UC Berkeley
Georgia Tech
PNL
U of WI, Madison
U of IL, Urbana-Champaign
Cornell University
PSERC
ornl
BERKELEY LAB
ELECTRIC POWER GROUP
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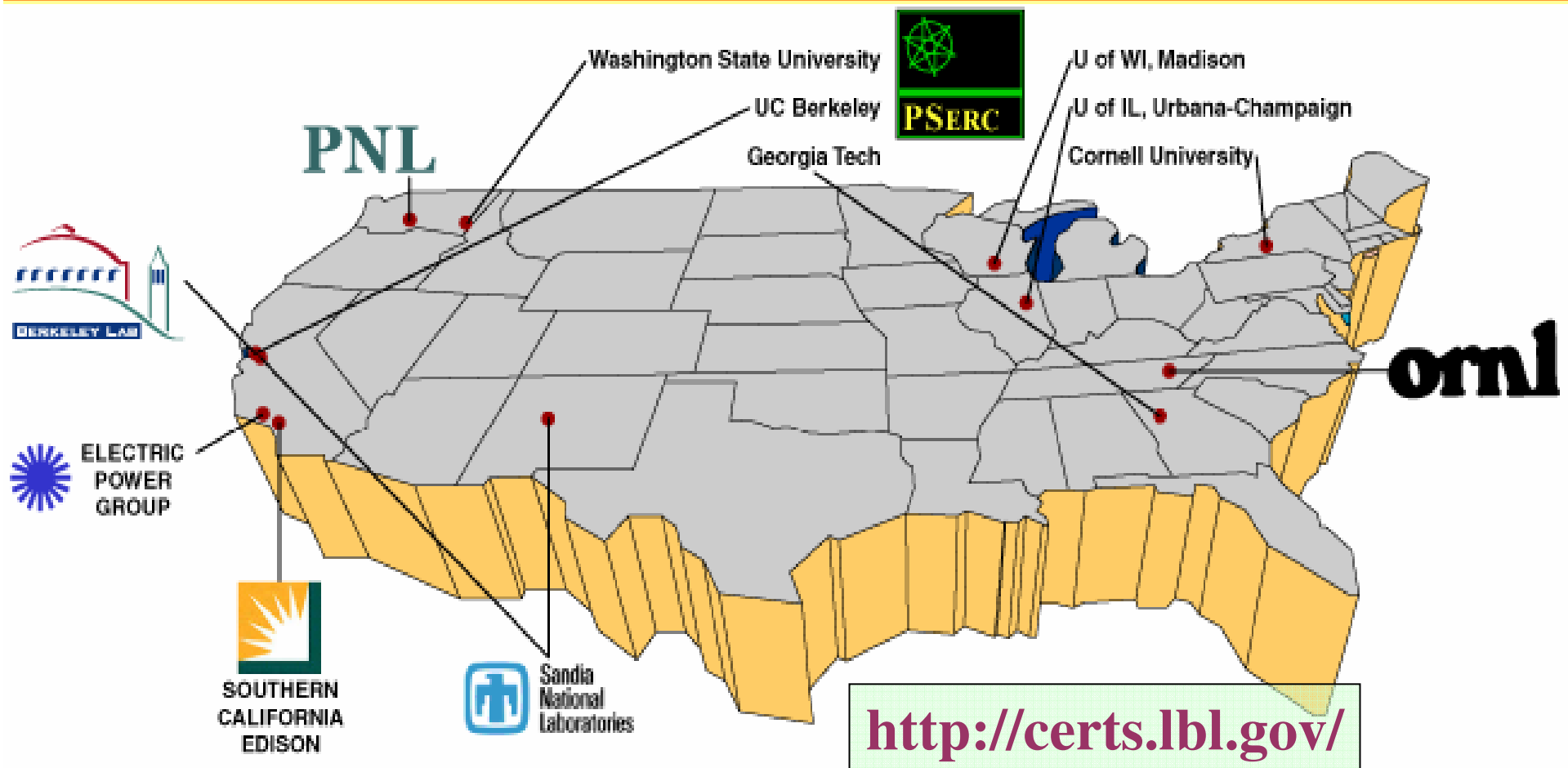
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Example CERTS Microgrid
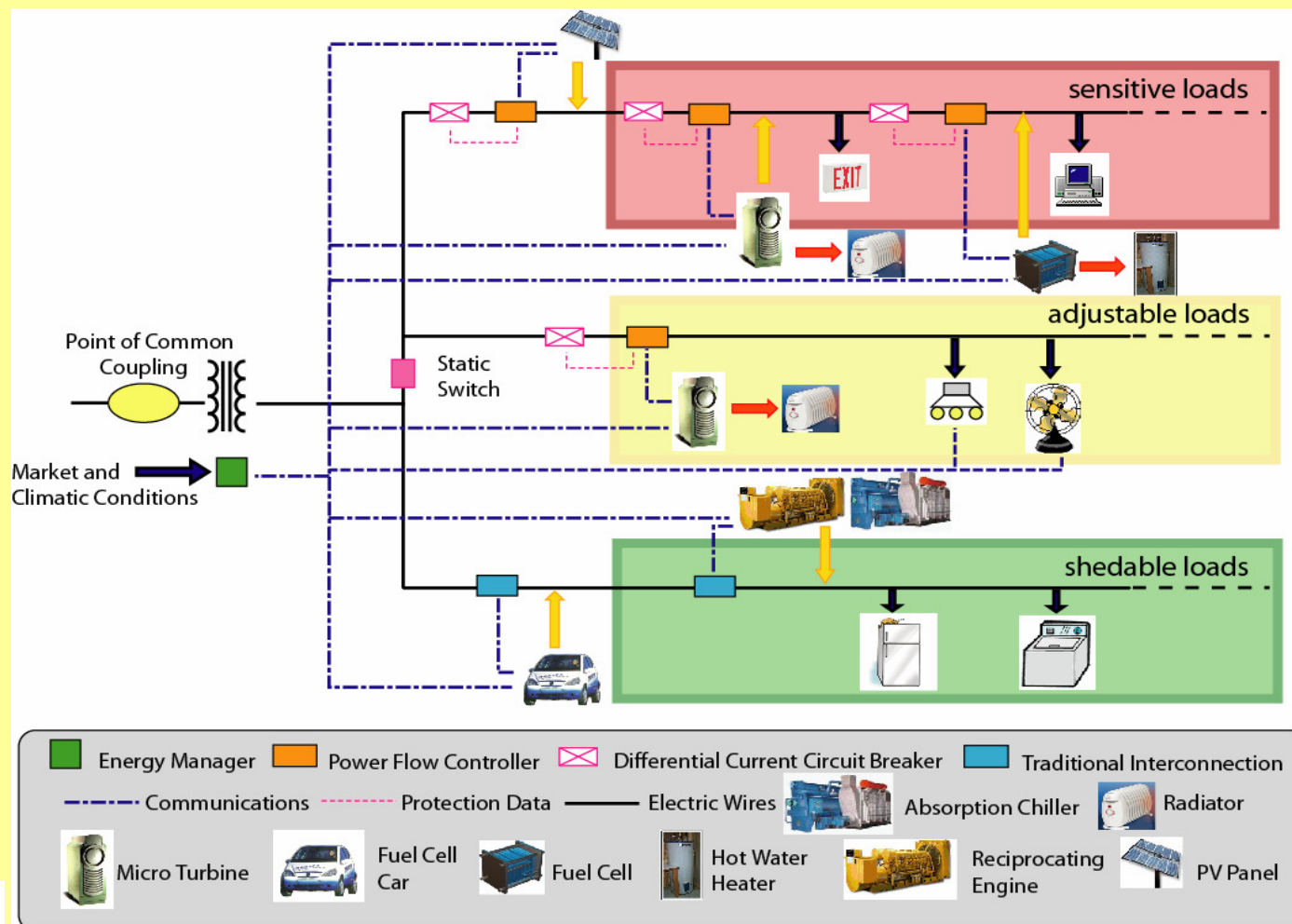
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Dolan Tech Center, Columbus OH

http://certs.aeptechlab.com/

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Sources are 3 X 60 kW Gensets

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NTT Facilities Microgrid Sendai, Japan

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Thanks!

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